

Advanced Manufacturing of Intermediate Temperature, Direct Methane Oxidation Membrane Electrode Assemblies for Durable Solid Oxide Fuel Cell, Phase I

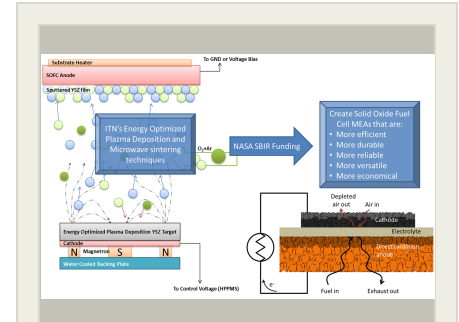
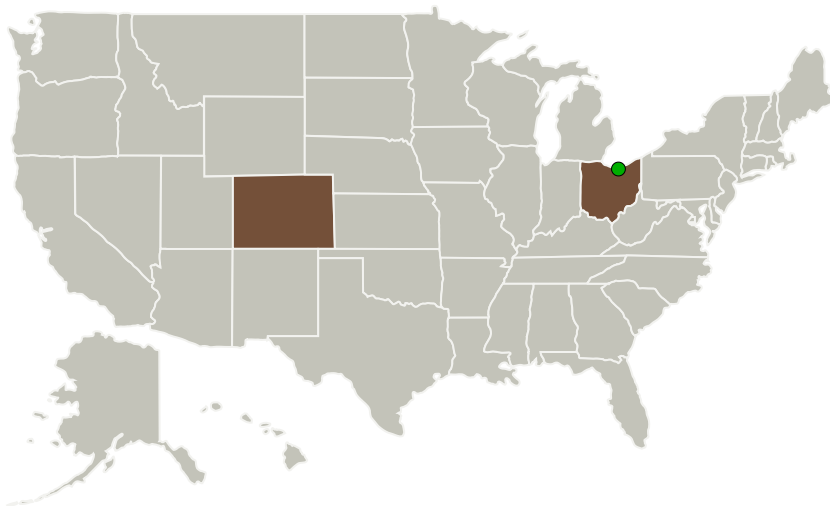
Completed Technology Project (2013 - 2013)



Project Introduction

ITN proposes to create an innovative anode supported membrane electrode assembly (MEA) for solid oxide fuel cells (SOFCs) that is capable of long-term operation at low temperature by the direct oxidation of dry methane or syngas fuel without coke formation on the anode. ITN's MEA is more efficient, durable, reliable, versatile and economical than the state of the art because it is made with transformative manufacturing techniques – microwave sintering and energy optimized plasma deposition (EOPD). The proposed fuel-flexible, direct oxidation MEA is capable of power densities up to 2 W/cm² at 600°C. ITN's EOPD of thin, conformal YSZ electrolytes creates a stress free interface between the anode and electrolyte which improves MEA durability, cycle-ability and cell performance. The MEAs produced in this research effort can be incorporated into SOFC stacks capable of producing power in the 1-3 kW range. Because the fuel is oxidized directly in the SOFC, without external fuel processing, the thermodynamic efficiencies from fuel source to DC output exceed 70%. Higher efficiencies translate to minimal cooling required as obtained by way of conduction through the stack to a radiator exposed to space and/or by anode exhaust flow.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
ITN Energy Systems, Inc.	Lead Organization	Industry Minority-Owned Business	Littleton, Colorado
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Colorado	Ohio

Project Transitions

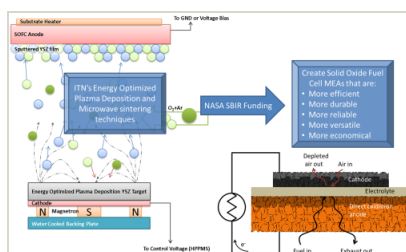
May 2013: Project Start

November 2013: Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140416>)

Images



Project Image

Advanced manufacturing of intermediate temperature, direct methane oxidation membrane electrode assemblies for durable solid oxide fuel cell
(<https://techport.nasa.gov/image/126555>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

ITN Energy Systems, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

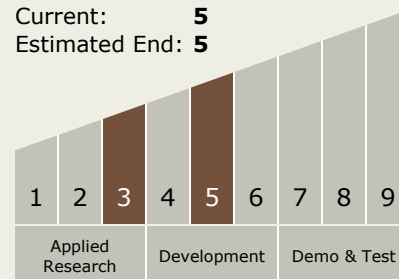
Carlos Torrez

Principal Investigator:

Paul Thoen

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



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Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
 - └ TX03.1 Power Generation and Energy Conversion
 - └ TX03.1.4 Dynamic Energy Conversion

Target Destinations

The Sun, Earth, The Moon,
Mars, Others Inside the Solar
System, Outside the Solar
System